HYDRAULIC DESIGN ADVISORY
HDA 05-04

DATE: JULY 28, 2005, REVISED AUGUST 24, 2005

SUBJECT: Application of NRCS' "TR-55" and "TR-20" Hydrologic Computations Using NOAA ATLAS 14 Rainfall Data

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This HDA supplements Hydraulic Design Advisory HDA 05-03, issued 06/21/05 & revised 07/18/05. When using hydrologic computational methods based on 24-hr. point rainfall such as the National Resource Conservation Service's (NRCS) "TR-55" and "TR-20" or other methods predicated on the application of NRCS' procedures, it will be necessary to use NOAA's "ATLAS-14" Rainfall Precipitation Frequency Data. This will be required whenever these hydrologic computational methods are employed in drainage designs for Department projects or those that will ultimately come under the Department's jurisdiction. This takes effect with the issuance of this Hydraulic Design Advisory. Exceptions in the case of projects already underway are outlined in HDA 05-03.

The 24-hr. Rainfall Depths table for Virginia, presented in the VDOT DRAINAGE MANUAL in Chapter 11, Appendix 11C-3, has been revised to reflect the NOAA "ATLAS-14" data for the 2 to 100-yr. rainfall frequency events. Since "ATLAS-14" does not provide total point rainfall data for the 1-yr. event, the table continues to show the same 1-yr. rainfall depths presented in the publication VIRGINIA STORMWATER MANAGEMENT HANDBOOK (1st Ed., Vol. II, 1999). The revised table will be included in the next formal revision to the VDOT DRAINAGE MANUAL. A copy of the revised table is attached to this Hydraulic Design Advisory.

It should be noted that using the 1-yr., 24-hr. rainfall as taken from the Virginia Department of Conservation & Recreation's (DCR) handbook occasionally causes it to be greater than the 2-yr., 24-hr. rainfall taken from NOAA's "ATLAS-14" in the case of certain municipalities. At first glance this appears to be an anomaly. To explain this disparity it should be noted that Department currently uses the 1-yr., 24-hr. rainfall only in conjunction with the design of water quality facilities. Such designs are predicated on the Virginia Department of Conservation & Recreation's (DCR) regulatory requirements. Those requirements, in turn, are currently predicated on the use of the 1-yr., 24-hr. rainfall presented in their handbook. The Department's annual DCR E&S certification is also dependent on adherence to those requirements. The Department, therefore, will continue to use the DCR's 1-yr., 24-hr. rainfall data until such time as they revise their handbook to reflect the newer, NOAA "ATLAS-14" data, but only for the purposes stated above. All other hydrologic computations predicated on NRCS (or other procedures) using 24-hr. rainfall should be predicated on the NOAA "ATLAS-14" based 2, 5, 10. 25, 50 & 100-yr. rainfall as presented in revised Appendix 11C-3.

Any comments or questions related to this Hydraulic Design Advisory should be directed to

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APPENDIX 11C-3 24-HR. RAINFALL DEPTHS (INCHES)

	FREQ. (YRS.)						
COUNTY	1	2	5	10	25	50	100
Accomack	3.0	3.4	4.4	5.3	6.6	7.8	9.1
Albemarle	3.3	3.7	4.7	5.6	6.8	7.9	9.1
Alleghany	2.5	2.7	3.4	4.0	4.8	5.5	6.3
Amelia	3.0	3.3	4.2	5.0	6.2	7.1	8.2
Amherst	3.3	3.5	4.4	5.2	6.4	7.4	8.5
Appomattox	3.0	3.4	4.4	5.2	6.4	7.4	8.5
Arlington	2.7	3.2	4.1	4.8	6.1	7.1	8.4
Augusta	3.0	2.9	3.6	4.3	5.2	5.9	6.7
Bath	2.5	3.0	3.8	4.4	5.3	6.1	7.0
Bedford	3.3	3.4	4.3	5.1	6.3	7.3	8.4
Bland	2.4	2.6	3.1	3.5	4.1	4.5	4.9
Botetourt	3.0	3.4	4.3	5.1	6.2	7.2	8.2
Brunswick	3.0	3.4	4.3	5.1	6.3	7.2	8.2
Buchanan	2.4	2.6	3.2	3.7	4.4	5.0	5.6
Buckingham	3.0	3.4	4.3	5.1	6.3	7.3	8.4
Campbell	3.0	2.9	3.6	4.3	5.2	5.9	6.7
Caroline	2.7	3.3	4.2	5.0	6.3	7.4	8.6
Carroll	2.8	3.3	4.2	5.0	6.0	6.9	7.8
Charles City	3.0	3.4	4.4	5.3	6.5	7.6	8.8
Charlotte	3.0	3.3	4.2	5.0	6.1	7.1	8.1
Chesapeake (city)	3.2	3.7	4.7	5.6	7.0	8.1	9.4
Chesterfield	3.0	3.4	4.3	5.1	6.3	7.3	8.4
Clarke	2.7	2.8	3.5	4.1	4.9	5.6	6.4
Craig	2.5	2.8	3.6	4.2	5.1	5.8	6.6
Culpeper	3.0	3.3	4.3	5.1	6.3	7.4	8.6
Cumberland	3.0	3.3	4.2	5.0	6.1	7.1	8.1
Dickenson	2.4	2.6	3.2	3.7	4.5	5.1	5.7
Dinwiddie	2.9	3.4	4.4	5.2	6.4	7.4	8.4
Essex	3.0	3.2	4.2	5.0	6.3	7.4	8.7
Fairfax	2.7	3.2	4.1	4.9	6.1	7.2	8.5
Fauquier	2.9	3.1	4.0	4.8	5.9	7.0	8.2
Floyd	3.0	3.6	4.5	5.4	6.6	7.6	8.7
Fluvanna	3.0	3.2	4.1	4.9	6.0	6.9	8.0
Franklin	3.3	3.4	4.4	5.2	6.4	7.4	8.5
Frederick	2.5	2.9	3.6	4.2	5.0	5.7	6.5
Giles	2.4	2.5	3.1	3.6	4.4	5.0	5.7
Gloucester	3.0	3.5	4.6	5.5	6.8	7.9	9.2
Goochland	3.0	3.3	4.2	5.0	6.1	7.1	8.2
Grayson	2.8	2.5	3.2	3.7	4.5	5.1	5.8
Greene	3.3	3.5	4.5	5.3	6.6	7.6	8.7
Greensville	3.0	3.3	4.3	5.1	6.2	7.1	8.1
Halifax	3.0	3.2	4.1	4.9	6.0	6.9	7.9
Hampton (city)	3.1	3.6	4.6	5.5	6.9	8.0	9.3

APPENDIX 11C-3 24-HR. RAINFALL DEPTHS (INCHES)

	FREQ. (YRS.)						
COUNTY	1	2	5	10	25	50	100
Hanover	2.8	3.3	4.2	5.0	6.3	7.4	8.6
Henrico	2.8	3.3	4.2	5.0	6.3	7.4	8.6
Henry	3.0	3.5	4.4	5.2	6.4	7.4	8.5
Highland	2.8	2.9	3.6	4.1	4.8	5.4	6.0
Isle of Wight	2.9	3.6	4.7	5.6	6.9	8.0	9.2
James City	2.8	3.6	4.6	5.5	6.8	8.0	9.2
King & Queen	2.8	3.3	4.2	5.1	6.3	7.4	8.7
King George	2.8	3.2	4.1	4.9	6.2	7.3	8.5
King William	2.8	3.3	4.2	5.1	6.3	7.4	8.6
Lancaster	2.8	3.3	4.3	5.2	6.5	7.6	8.9
Lee	2.7	3.2	3.9	4.5	5.3	6.0	6.8
Loudoun	3.0	3.1	4.0	4.7	5.9	6.9	8.0
Louisa	2.9	3.3	4.2	5.0	6.2	7.2	8.3
Lunenburg	2.9	3.3	4.2	5.0	6.1	7.1	8.2
Madison	3.3	3.4	4.4	5.2	6.4	7.4	8.5
Mathews	3.0	3.5	4.5	5.4	6.7	7.9	9.2
Mecklenburg	2.9	3.3	4.2	4.9	6.0	7.0	8.0
Middlesex	3.0	3.4	4.4	5.3	6.6	7.8	9.0
Montgomery	2.5	2.8	3.5	4.1	5.0	5.8	6.6
Nelson	3.3	3.7	4.7	5.6	6.9	8.0	9.2
New Kent	2.8	3.4	4.4	5.2	6.5	7.6	8.8
Newport News (city)	3.1	3.6	4.6	5.5	6.9	8.0	9.3
Norfolk (city)	3.1	3.6	4.6	5.5	6.8	8.0	9.2
Northampton	3.1	3.3	4.3	5.2	6.5	7.7	9.0
Northumberland	2.8	3.3	4.3	5.1	6.4	7.6	8.8
Nottoway	3.0	3.3	4.2	5.0	6.2	7.1	8.2
Orange	3.2	3.3	4.3	5.1	6.3	7.3	8.4
Page	2.5	3.2	4.1	4.8	5.9	6.8	7.7
Patrick	2.8	3.9	5.0	5.9	7.2	8.4	9.7
Pittsylvania	2.8	3.3	4.2	5.0	6.1	7.1	8.1
Powhatan	3.0	3.3	4.2	4.9	6.1	7.1	8.1
Prince Edward	3.0	3.3	4.2	5.0	6.2	7.2	8.2
Prince George	3.0	3.4	4.4	5.2	6.4	7.4	8.5
Prince William	3.0	3.0	3.9	4.6	5.8	6.8	8.0
Pulaski	2.5	2.4	3.0	3.5	4.2	4.8	5.5
Rappahannock	3.0	3.4	4.3	5.0	6.1	7.1	8.1
Richmond	3.0	3.3	4.3	5.1	6.4	7.5	8.8
Roanoke	3.0	3.1	3.9	4.6	5.6	6.4	7.3
Rockbridge	3.0	2.9	3.6	4.3	5.2	6.0	6.8
Rockingham	3.0	2.6	3.3	3.9	4.7	5.4	6.1
Russell	2.5	2.7	3.3	3.7	4.4	4.9	5.5
Scott	2.6	2.5	3.1	3.6	4.2	4.8	5.3
Shenandoah	2.5	2.8	3.5	4.0	4.9	5.6	6.3

APPENDIX 11C-3 24-HR. RAINFALL DEPTHS (INCHES)

	FREQ. (YRS.)						
COUNTY	1	2	5	10	25	50	100
Smyth	2.6	3.0	3.6	4.0	4.7	5.2	5.7
Southampton	2.8	3.5	4.5	5.4	6.6	7.7	8.8
Spotsylvania	3.1	3.2	4.1	4.9	6.1	7.2	8.4
Stafford	2.9	3.2	4.1	4.9	6.1	7.2	8.4
Suffolk (city)	3.2	3.6	4.7	5.6	6.9	8.1	9.3
Surry	2.8	3.5	4.6	5.5	6.7	7.9	9.1
Sussex	2.8	3.5	4.5	5.3	6.5	7.5	8.5
Tazewell	2.5	2.5	3.0	3.4	4.0	4.4	4.9
Virginia Beach (city)	3.0	3.7	4.7	5.7	7.0	8.2	9.4
Warren	2.8	3.0	3.8	4.4	5.3	6.1	7.0
Washington	2.6	2.6	3.0	3.4	3.9	4.2	4.6
Westmoreland	2.8	3.2	4.2	5.0	6.3	7.4	8.6
Wise	2.5	2.7	3.3	3.8	4.6	5.2	5.9
Wythe	2.6	2.5	3.1	3.6	4.2	4.8	5.3
York	3.0	3.6	4.6	5.5	6.9	8.1	9.4

Source: 1-yr. rainfall depth – Virginia Stormwater Management Handbook, 1st Ed., Vol. II, 1999

Source: 2 through 100-yr. rainfall depths – NOAA Atlas 14 Precipitation Frequency Estimates, Vol. 2, Version 2.1, 2005